

REMARKS/ARGUMENTS

Reconsideration of the application in light of the amendments above and the remarks and arguments below is respectfully requested.

I. Status of the Claims

Claims 1, 15, and 16 were previously pending.

Claim 1 is amended in this Preliminary Amendment to correct a typographical error, *i.e.*, to amend “power” to “powder.” No new matter is introduced by this amendment.

New claim 22 is added. It is directed to a method for forming a sintered product from a powder, and incorporates all the elements recited in claim 1 (which is directed to a method for forming a compact from a powder). The elements additionally recited in claim 22 are the steps of “pressing the raw powder to form a compact” and “sintering the compact to form a sintered product.” Support for these additional elements can be found in the Specification as originally filed, for example, on page 1, lines 9-11. No new matter is introduced by new claim 22.

New claim 23 is also added. It depends from claim 1 and further recites that “the step of applying a solution is carried out by spraying the solution.” Support for this element can be found in the Specification as originally filed, for example, on page 5, line 28, through page 6, line 1. No new matter is introduced by new claim 23.

Claims 2-14 and 17-19 were previously canceled in this application without prejudice to or disclaimer of the subject matter contained therein.

Claims 20 and 21 have been withdrawn from consideration without prejudice to or disclaimer of the subject matter contained therein.

Upon entry of this Preliminary Amendment, claims 1, 15, 16, 22, and 23 are pending and at issue.

II. Amendments to the Specification

The Specification is amended to correct translation errors that were inadvertently introduced in preparing an English translation of the Japanese-language specification filed in the parent PCT application (PCT/JP2003/014643). The corresponding original paragraph appears on page 5, lines 17-29, of the PCT publication (WO 2004/045841 A1). This page is attached as Exhibit A. A certificate of translation attesting to the accuracy of the translation corrections is attached as Exhibit B.

III. Information Disclosure Statement

Applicant confirms and appreciatively thanks Examiner Bell for initialing and signing the Information Disclosure Statement filed on April 18, 2005, which listed the only reference cited in the Specification.

IV. Withdrawal of Objection to the Specification

Applicant also appreciatively thanks the Examiner for withdrawing the objection to the Specification issued in the Non-Final Office Action of September 17, 2008.¹

V. Withdrawal of Nonstatutory Double Patenting Rejection

Applicant further appreciatively thanks Examiner Bell for withdrawing the provisional rejection of the pending claims on the ground of nonstatutory double patenting issued in the Non-Final Office Action of September 17, 2008.²

¹ Final Office Action of April 2, 2009, page 5, lines 2-4.

² Final Office Action of April 2, 2009, page 6, lines 3-6.

VI. Objection to Claim 1

Claim 1 stands objected to because the word “power” in line 7 of the claim appears to be a typographical error. Applicant appreciatively thanks the Examiner for pointing this error out and for proceeding to examine the claim on the assumption that the word should read as “powder.”

Applicant has amended claim 1 in this Preliminary Amendment to correct the term “power” to recite “powder.” Accordingly, Applicant respectfully requests that the objection to claim 1 be withdrawn.

VII. Rejection of Claims 1 and 16 under 35 U.S.C. § 102(b)/§ 103(a) over Kondo

Claims 1 and 16 stand rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as unpatentable over European Patent Application Publication No. EP 1 170 075 A1 to Kondo et al. (“Kondo”). The Examiner contends that Kondo discloses all the elements recited in claims 1 and 16 or, in the alternative, Kondo in combination with ordinary skill in the art renders claims 1 and 16 obvious. Applicant respectfully traverses the rejection.

Claim 1 recites that the solution obtained by dissolving a lubricant in a solvent “has said lubricant completely dissolved in water into a uniform phase.” Applicant respectfully submits that Kondo does not teach or suggest this element. Kondo only discloses that the lubricant is “dispersed,” “dispersed and suspended,”³ or “finely dispersed”⁴ in a solvent. It does not disclose that the lubricant is completely dissolved into a uniform phase.

The effect of such complete dissolution is that when the solution is evaporated and a crystallized layer of the lubricant is formed, solid powder particles will be absent from the layer. The disadvantage of having solid powder remaining in the layer is described by the present inventors in the Specification as follows.⁵

³ For example, Kondo, paragraph [0049], line 3; paragraph [0073], subparagraph 3, lines 7-9.

⁴ For example, Kondo, paragraph [0070], line 4.

⁵ Specification as originally filed on April 18, 2005, page 2, lines 11-15.

According to the conventional art disclosed in the above documents, however, since the lubricant dispersed in water is applied to the mold in a state of solid powders, that is, in such state that the solid powders of the lubricant are dispersed and mixed in water, a fine film can not be formed, and thus there is a problem that producing a compact of a stable quality is difficult.

The fact that Kondo refers to “a ball-mill pulverization” process or treatment⁶ reinforces the understanding that Kondo only contemplates dispersed systems.

Further, Applicant respectfully submits that contrary to the Examiner’s contention, one of ordinary skill in the art would have been taught away from using a water-soluble lubricant (such as sodium stearate) in Kondo’s systems. As explained in the Declaration filed on January 16, 2009, and signed by both inventors of the present application:

A flow of a material powder may be hindered so that molding may become impossible if a water-soluble chemical substance having moisture-absorption characteristics is used, since compaction molding is normally performed with lubricant being mixed in a material powder. Water-soluble chemical substances have not been used in this area⁷

Moreover, although sodium stearate was a known compound at the time of Kondo’s disclosure, Kondo makes no mention of this chemical substance. It only makes frequent reference to the trio of “lithium stearate, calcium stearate, and zinc stearate,”⁸ with additional minor mention of “barium stearate, lithium palmitate, lithium oleate, calcium palmitate, and calcium oleate.”⁹ This is not surprising since Kondo would not have been able to prepare a dispersed system with a water-soluble lubricant such as sodium stearate.

The unexpected results obtained by the “completely dissolved” process of claim 1 of the present invention as opposed to a “dispersed” process are described in the Specification as follows.¹⁰

⁶ For example, Kondo, paragraph [0048], line 4; paragraph [0073], subparagraph 3, lines 3-4.

⁷ Declaration filed on January 16, 2009, and signed by Takashi Nakai and Kinya Kawase, paragraph 10, lines 1-4.

⁸ For example, Kondo, paragraph [0063], line 2; paragraph [0105], line 3; paragraph [0116], line 1; paragraph [0123], line 4.

⁹ For example, Kondo, paragraph [0039], lines 3-4.

¹⁰ Specification as originally filed on April 18, 2005, page 9, lines 7-13.

Comparison result from Tables 1 to 3 indicates that the force required for ejecting a compact from a die in the examples [*i.e.*, the “dissolved” cases] were less than or equal to that of the comparative example 1 [*i.e.*, the “dispersed” case]. Besides, the densities were improved in the examples as compared to the comparative example 1. Moreover, the densities R in the examples noticeably became smaller than that of the comparative example 1. Therefore, it is apparent from the result that the high-density molding can be stably carried out according to the preferred examples, even though it is carried out successively.

In particular, the variable R here refers to the “difference between maximum and minimum values in the density of 100 compacted bodies continuously molded.”¹¹ Thus, a small R means that a compact of a stable quality is being produced.

At least for these reasons, Applicant respectfully submits that Kondo does not anticipate claim 1, and Kondo in view of ordinary skill in the art does not render claim 1 obvious. Accordingly, Applicant respectfully requests that the rejection of claim 1 on the basis of Kondo be withdrawn.

Claim 16 depends from claim 1. Therefore, at least for the same reasons as stated above for claim 1, Applicant respectfully submits that Kondo does not anticipate claim 16, and Kondo in view of ordinary skill in the art does not render claim 16 obvious. Accordingly, Applicant respectfully requests that the rejection of claim 16 on the basis of Kondo be withdrawn.

VIII. Rejection of Claim 15 under 35 U.S.C. § 103(a) over Kondo in View of Murata

Claim 15 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Kondo in view of International Patent Application Publication No. WO 97/48783 to Murata et al. (“Murata”). The Examiner contends that Kondo in combination with Murata renders claim 15 obvious. Applicant respectfully traverses the rejection.

Claim 15 depends from claim 1. The rejection of claim 15 is based on the premise that either Kondo anticipates claim 1 or Kondo in view of ordinary skill in the art renders claim 1 obvious.

¹¹ Specification as originally filed on April 18, 2005, page 7, lines 8-10.

However, as discussed above, Kondo does not anticipate claim 1, and Kondo in combination with ordinary skill in the art does not render claim 1 obvious.

At least for this reason, Applicant respectfully submits that Kondo in view of Murata does not render claim 15 obvious, and respectfully requests that the rejection of claim 15 on the basis of Kondo and Murata be withdrawn.

IX. New Claims 22 and 23

New claim 22 incorporates all the elements recited in claim 1. New claim 23 depends from claim 1. Accordingly, Applicant respectfully submits that claims 22 and 23 are patentable over the prior art, including Kondo and Murata.

CONCLUSION

In view of the foregoing, it is believed that claims 1, 15, 16, 22, and 23 are in immediate condition for allowance and it is respectfully requested that the application be reconsidered and that all pending claims be allowed and the case passed to issue.

If there are any other issues remaining which the Examiner believes could be resolved through a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned at the telephone number indicated below.

Dated: July 2, 2009

Respectfully submitted,

By 

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Exhibit A

結果、溶液 L は蒸発、乾燥して貫通孔 1 の周面には結晶が成長して、図 1 B に示すように前記潤滑剤の晶出層 B が均一に形成される。

次に図 2 の第 2 工程に示すように、フィーダー 5 が前進して原料粉末 M を成形部 1 A に落下させて充填する。次に図 3 の第 3 工程に示すように、ダイ 2 を下方
5 に移動させると共に、貫通孔 1 の成形部 1 A に上方から上パンチ 4 を挿入し、上パンチ 4 と下パンチ 3 とで挟むようにして原料粉末 M を圧縮する。このとき、下パンチ 3 は、下端が固定されており動かないようになっている。そして、この第 3 工程において、原料粉末 M は、潤滑剤により形成されている晶出層 B に潤滑状態で圧縮される。

10 このように加圧成形された粉末成形体 A は、ダイ 2 が更に下方に下がり、図 4 の第 4 工程で示すように下パンチ 3 の上面がダイ 2 の上面と略同じ高さになったとき取出し可能となる。この取り出しの際においても、潤滑剤により形成されている晶出層 B に粉末成形体 A は潤滑状態で接触する。このようにして、粉末成形体 A が取出された後、再び第 1 工程に戻って再び成形部 1 A に溶液 L が噴霧され
15 て晶出層 B が形成された後に、原料粉末 M が成形部 1 A に充填されるものである。

以下に、実施例及び比較例を表 1 ～ 3 により説明する。表 1 ～ 3 における実施例及び比較例は、いずれも原料粉末として鉄粉（平均粒径 $90 \mu\text{m}$ ）に、潤滑剤としてステアリン酸リチウム（平均粒径 $5 \mu\text{m}$ ）を 0.2 重量% 添加したものを
20 回転混合機で 30 分混合したものを用い、加圧面積 1 cm^2 の円柱を成形する成形型に、前記混合した原料粉末を 7 g 充填し、この後 8 t/cm^2 の成形圧力で粉末成形体を連続で 100 個成形したものである。そして、実施例のものでは、水溶性潤滑剤を水に溶解した溶液を 150°C に加熱された成形型の成形部に付着させた後に、蒸発、乾燥させて晶出層を形成し、この後に、原料粉末を充填す
25 るようにしたものである。比較例 1 は、ステアリン酸リチウム（平均粒径 $5 \mu\text{m}$ ）をアセトンに分散させたものを 150°C に加熱された成形型の成形部に付着させた後に、乾燥させて被膜を形成し、この後に、原料粉末を充填するようにしたものである。比較例 2 は成形型には潤滑剤を用いない場合である。表中の密度の R は、連続 100 個成形した成形体密度の最大値と最小値の差である。

Exhibit B

Translation Certification

Document Translated: Paragraph appearing on page 5, lines 17-29, of WO 2004/045841 A1
(publication of PCT/JP2003/014643).

This is to certify that the English paragraph presented below represents an accurate and faithful rendition of the above-stated Japanese-language paragraph to the best of my knowledge and belief.

Preferred examples and comparative examples will now be explained with reference to Tables 1 to 3. In each of the preferred examples and comparative examples shown in Tables 1 to 3, iron powders (average particle diameter: 90 μm) were used as the raw powder, to which was added 0.2% by weight of lithium stearate (average particle diameter: 5 μm) serving as the lubricant, which were then stirred for 30 minutes using a rotary mixer, so that 7g of the resultant mixture of the raw powder was filled into a mold forming a cylindrical column having a 1 cm^2 pressurization area, and then 100 compacts were successively formed at a forming pressure of 8 t/cm^2 . In the preferred examples, after the solution of the water-soluble lubricant dissolved in water was applied to the forming portion heated at 150deg C in the mold, it was evaporated and dried to form the crystallized layer, and then the raw powders were filled into this forming portion. In the comparative example 1, after the solution of lithium stearate (average particle diameter: 5 μm) dispersed in acetone was applied to the forming portion of the mold heated at 150deg C, it was evaporated and dried to form a film, and then the material powders were filled into this forming portion. The comparative example 2 is a case in which the lubricant was not applied to the mold. Density R in each Table shows difference between maximum and minimum values in the density of 100 compacted bodies continuously molded.

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